DOCUMENT RESUME

ED 062 208 24 SE 013 733

AUTHOR	Klausmeier, Herbert J.
TITLE	A Proposal to Disseminate Patterns in Arithmetic and to Determine Effectiveness of Dissemination. Final Report.
INSTITUTION	Wisconsin Univ., Madison. Research and Development Center for Cognitive Learning.
SPONS AGENCY	National Center for Educational Communication (DHEW/OE), Washington, D.C.
BUREAU NO	BR-0-0712
PUB DATE	Jan 72
CONTRACT	OEC-0-70-4945(508)
NOTE	60p.
EDRS PRICE	MF-$0.65 HC-$3.29
DESCRIPTORS	*Curriculum Development; *Elementary School Mathematics; *Information Dissemination; Mathematics Education; *Research and Development Centers
IDENTIFIERS	Patterns in Arithmetic

ABSTRACT

The primary purpose of this project was to disseminate information about Patterns in Arithmetic (PIA), a grade one through six mathematics program developed by the Wisconsin Research and Development Center for Cognitive Learning. Over 30,000 short brochures were mailed to mathematics supervisors, elementary principals, superintendents, coordinators, and others. Those who requested further information (471 persons) were sent a longer publication describing PIA in more detail. Of these, 63 also accepted an invitation to attend a one-day awareness conference, and 34 actually attended; these persons also completed two questionnaires. Characteristics of those responding at various stages are analyzed, and various conclusions are drawn about this method of disseminating the program. (MM)

ED 062208

FINAL REPORT

Project No. 0-0712

Contract No. OEC-0-70-4945(508)

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A PROPOSAL TO DISSEMINATE PATTERNS IN ARITHMETIC AND TO DETERMINE EFFECTIVENESS OF DISSEMINATION

Herbert J. Klausmeier,
Principal Investigator

Report Prepared by James E. Walter and Mary Horn

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This report was prepared by the Wisconsin Research and Development Center for Cognitive Learning which is funded in part by the United States Office of Education, Department of Health, Education, and Welfare. The opinions expressed in Center publications do not necessarily reflect the position or policy of the Office of Education and no official endorsement by the Office of Education should be inferred.

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CONTENTS

	Page
LIST OF TABLES	iii
ABSTRACT	iv
I. INTRODUCTION TO THE PROBLEM	1
II. METHOD AND SCOPE OF ACTIVITIES	3
Objectives	3
Assumptions	3
Procedures	5
III. RESULTS	7
Responses to First Mailings	7
Responses to Second Mailing	9
Responses to First Questionnaire	12
Responses to Second Questionnaire	15
Costs	16
IV. CONCLUSIONS AND RECOMMENDATIONS	18
Overview	18
Some Conclusions	19
Recommendations	23
Summary	24
Appendix A. Printed Materials	
Appendix B. Questionnaires	

LIST OF TABLES

Table		Page
1	Codes, Categories, and Number Sent in First Mailing With Number and Percentage of Returns	8
2	Persons by Position Title Responding in Each Category	10
3	Number and Percentage of Persons by Position Title in Attendance at Conferences	11
4	Number Indicating Adoption Plans	14

ABSTRACT

The procedures and results of an information dissemination technique involving direct mail activities and conferences are described in this report. The approach described in this document was utilized by the Wisconsin Research and Development Center for Cognitive Learning in an effort to create more awareness of Patterns in Arithmetic.

Analysis of the results of the project indicates that the direct mail and conference procedures are a viable means for systematic and focused dissemination of information. Nearly 32,000 school personnel became aware of the product, some 12,000 for the first time. The procedures utilized in this effort appear to provide a more efficient and effective dissemination effort than can be realized by more conventional and general efforts. Due to the perceived characteristics and implementation costs of the product, however, attendance at the one-day awareness conference was less than projected.

I

INTRODUCTION TO THE PROBLEM

Patterns in Arithmetic (PIA) is a complete set of materials consisting of 336 15-minute video tapes, teacher's manuals, and student workbooks for a Grade 1-6 mathematics program. One of the first major products of the Center, development of PIA started at the time the Center was first organized in 1964. Development and field testing of the product was completed in the spring of 1970. Formative and summative evaluation of PIA showed it to be an effective instructional program. Since PIA provides continuity in mathematics instruction, it is particularly appropriate in school settings where there is high student transiency within the district and/or where there is high teacher turnover. An additional advantage is that elementary teachers poorly prepared in modern mathematics concepts and teaching techniques receive inservice training while students are learning.

Under an agreement with the Center, National Instructional Television Center (NITC), a nonprofit agency located in Bloomington, Indiana, is distributing the series nationally. The series can be rented or purchased in standard broadcast format or purchased in an audiovisual format suitable (within certain limitations) for individualized instruction.

In the 1969-1970 school year an estimated 330,000 pupils and 10,000 teachers were using those portions of PIA that were available. These users represented only a small portion of the total potential users, and at the rate of adoption projected at that time the program would have outlived its usefulness before widescale adoption occurred. In order for PIA to be

utilized as widely as possible, a systematic, concerted effort was required to inform potential users of the availability and nature of the product.

Prior to this project, dissemination of information about PIA had been limited to articles in professional journals and newsletters, presentations at national conferences, and advertisements sponsored by NITC. Such an approach, it was felt, was not systematic and required too much time to reach large numbers of potential users. The Center, therefore, decided to employ a direct mail campaign followed up by a one-day conference in an effort to create as much awareness as possible about PIA within the existing limitations. In addition, NITC would continue its usual advertising and promotional activities with regard to PIA.

II

METHOD AND SCOPE OF ACTIVITIES

Objectives

The primary purpose of this project was to disseminate information about PIA to potential adopters, school districts and intermediate education agencies. The secondary purpose was to determine the persons, by position, who are most likely to respond to the invitations to request further information or to attend the one-day conferences.

Assumptions

From the outset it was assumed that persons with authority to make final decisions relative to the adoption of a product such as PIA would generally depend upon other persons to gather information about the product. It may be most fruitful to disseminate information primarily to influential persons--in other words, to persons to whom decision makers look for information and advice rather than to persons who, for various reasons, cannot act on the information. Identifying such persons is difficult, and for that reason information was sent to a range of positions.

A direct mail effort is one method for disseminating information to a large number of persons in a systematic, efficient, and rapid matter. By contrast, journal articles and presentations at professional conferences are not so systematic or efficient, since there are a number of variables over which the disseminator has little if any control. It is not always possible to place articles in those journals which go to the desired audience. Once

placed, articles in journals must compete with other articles and do not attract the singular attention of the reader. There are similar problems with professional conferences. The direct mail approach allows the message to be sent to the audiences desired with minimum competition.

A further assumption was that printed documents from the R&D Center should not be written in "hard sell" advertising-type language. Previous experience in communicating with educational practitioners had indicated that they were more receptive and likely to be convinced if the information was presented in a straightforward fashion without glossy Madison Avenue selling techniques. At the same time, materials must be presented in an attractive, readable, and quality document. Educational practitioners seem to expect one kind of approach from commercial profit-making publishers and another from an educational research and development agency. The printed materials were written and designed accordingly.

Printed information alone is not sufficient to make a person decide to adopt a relatively complex product. Thus it was assumed that more than printed information would be required. Other ingredients in the adoption process include a face-to-face communication with a knowledgeable person and an opportunity to see a demonstration. Since the latter was not possible in this project, a practitioner experienced with the product as well as an "expert" from the Center participated in the conferences. It is also important that the product not be so radically different that prospective adopters are intimidated by it.

Direct mail materials must compete with other mail that crosses the recipient's desk. It was decided, therefore, to send initially only an announcement-type brochure which would stimulate interest for more information available upon request. This procedure had the advantage of getting a

quick review of the product to the audiences that would not require too much time to read. A second advantage was that the more extensive and expensive description was provided only to those who were sufficiently interested in learning more about the product.

Procedures

The first step in the project was to prepare and distribute an "announcement" brochure to mathematics supervisors, elementary principals, superintendents of school districts with elementary schools, elementary coordinators, and intermediate education agency chiefs. Total distribution was 31,557 brochures. These brochures were designed as self-mailers and included a business reply card which the recipient could cut out and return to the Center for more information about the product. The card also provided an opportunity to indicate interest in attending a conference.

Reply cards were number coded to correspond with the target audiences indicated earlier. The codes provided a means for determining what happened to the brochure once it entered the school system, since the person returning the card was asked to provide his name and title. For example, a superintendent who received the brochure may have responded personally or he could have had a math supervisor or building principal respond. The reverse may also have taken place. With this kind of information it becomes possible to identify those who may be influential in decision making and those who provide the best entry point in the school system for generating the most response.

For people requesting more information, a 24-page brochure was sent along with another business reply card to indicate if they would attend one of the conferences. As with the first mailing, it was expected that some attrition would occur, although not to the same extent.

Following the distribution of the printed information, one-day awareness conferences were organized in April and May, 1971, in various regions of the country. Conferences were arranged to cover the Great Lakes states, the Plains states, the West Coast, the East Coast, and the Southeast.

In addition to the data gathered from the business reply cards, data were also gathered from questionnaires distributed at the conferences and then again in the fall following the conferences to determine adoptions and non-adoptions and, if the latter, the obstacles to adoption. No assumptions were made as to the relationship between the project's activities and adoption since prior to the project, some awareness had already been created by the Center and NITC through articles, news releases, and presentations at national professional conferences.

III

RESULTS

As indicated previously, data were gathered from three sources: the coded business reply cards distributed in the first mailing, a questionnaire distributed at the one-day conferences; and a questionnaire mailed to conference participants early in the fall of 1971. It should be remembered that the purpose of the project was to disseminate information about PIA, and not to conduct research on the dissemination process. Data were gathered, therefore, primarily to give some assessment of the feasibility and practicality of the approach already outlined. Information will now be presented with regard to responses to the initial mailings, then to the second mailings, next with regard to the first and second questionnaires, and finally with regard to the costs of such an effort.

Responses to First Mailings

The first mailing was an announcement brochure with a business reply card attached. It was sent to mathematics supervisors, school district superintendents, county or intermediate educational agency superintendents, elementary coordinators, public elementary school principals, and Catholic elementary school principals. In all, there were eight coded categories as shown in Table 1. An elementary coordinator was defined as any person at the school district's central office level who had responsibility for the elementary school program. The term "elementary coordinator" was used as a generic label for the category since such various titles as Assistant Superintendent

for Instruction, Elementary Supervisor, Elementary Coordinator, and so on are given the position. Addresses were purchased from an agency specializing in educational mailing lists and were selected randomly from each state.

Code	Category	# Mailed	# Returned	% Returned
#1	Math supervisors	721	48	6.65
#2	Superintendents in districts with 10,000 or more enrollment	698	37	5.30
#3	Superintendents in districts with 5,000-9,999 enrollment	1,064	15	1.40
#4	Superintendents in districts with 2,500-4,999 enrollment	2,021	35	1.73
#5	County superintendents	2,636	10	.37
#6	Elementary coordinators	7,417	175	2.35
#7	Public elementary school principals	15,000	132	.88
#8	Catholic elementary school principals	2,000	18	.90
Total		31,557	471	1.49

Table 1: Codes, Categories, and Number Sent in First Mailing With Number and Percentage of Returns

Table 1 also shows the number and percentage of cards mailed which were returned from the first mailing, by coded category. This table shows only the returns by category, not who returned the cards. For example, 721 brochures

were sent to category 1 (math supervisors), and 48 category 1 cards were returned. The returns were equal to 6.65% of the number mailed. However, some cards were returned by other than the original recipients in category 1 (math supervisors), as well as in the other categories.

Table 2 shows the number and percentage of persons by position title who returned the cards. For example, of the 48 cards returned in category 1, 31 (64.58%) were returned by math supervisors, the original recipients. Of the cards sent to math supervisors, eight were returned by elementary coordinators, three by public elementary principals, and six by persons in other positions. By comparison, 57.71% of the elementary coordinators returned their cards and 74.24% of the public principals and 88.88% of the Catholic principals returned their cards. When cards were not returned by the original recipients, particularly superintendents, they were most likely to be returned by math supervisors, elementary coordinators, and principals, in that order. Combined, these three categories accounted for 82.99% of the returns. If the direct returns from the math supervisors, elementary coordinators, and principals are deducted from the totals, the cards returned by these persons but originally sent to persons in other categories account for 30.78% of the total returned.

Responses to the Second Mailing

In response to the first mailing returns, a second and more informative publication, an invitation to a one-day awareness conference, and a return registration card were mailed to 471 persons. Table 3 shows to which positions these were sent. Also shown in Table 3 is the number of persons, by position title, who attended the conferences. There were 63 advance registrations and 34 who actually attended.

Category	# Returned	Math. Supers.		Supers. 10,000 or more		Supers. 5,000-9,999		Supers. 2,500 4,999		County Supers.		Elemen. Coord-inators		Public Prin-cipals		Catholic Prin-cipals		Teach-ers		Other*	
		#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
1	48	31	64.58	--	--	--	--	--	--	--	--	8	16.66	3	6.25	--	--	--	--	6	12.50
2	37	19	51.35	--	--	--	--	--	--	--	--	13	35.13	2	5.40	--	--	--	--	3	8.10
3	15	5	33.33	--	--	4	26.66	--	--	--	--	5	33.33	--	--	--	--	--	--	1	6.66
4	35	2	5.71	--	--	--	--	13	37.14	--	--	13	37.14	4	11.42	--	--	1	2.85	2	5.71
5	10	3	30.00	--	--	--	--	--	--	2	20.00	5	50.00	--	--	--	--	--	--	--	--
6	175	27	15.42	--	--	--	--	3	1.71	--	--	101	57.71	21	12.00	--	--	9	5.14	14	8.00
7	132	8	6.06	--	--	--	--	1	.75	--	--	6	4.54	98	74.24	--	--	15	11.36	5	3.78
8	18	--	--	--	--	--	--	--	--	--	--	1	5.55	--	--	16	88.88	--	--	1	5.55
Total	471	95	20.16	--	--	4	.84	17	3.60	2	.42	152	32.27	128	27.17	16	3.39	25	5.30	32	6.79

*"Other" in this table and subsequently in this report refers to ETV station representatives, teacher education personnel, and such positions as directors of research and evaluation, special project coordinators, or any position title not clearly identified with one of the others listed.

Table 2: Persons by Position Title Responding in Each Category

	# Invited	# Attending	% of Total Invited	% of Total Attending
Math Supervisors	95	7	7.36	20.58
Superintendents in districts with 10,000 or more enrollment	----	----	----	----
Superintendents in districts with 5,000-9,999 enrollment	4	----	----	----
Superintendents in districts with 2,500-4,999 enrollment	17	----	----	----
County super-intendents	2	----	----	----
Elementary coordinators	152	8	5.26	23.52
Public school elementary principals	128	5	3.90	14.70
Catholic school elementary principals	16	----	----	----
Teachers	25	6	24.00	17.64
Other	32	8	25.00	23.52
Total	471	34	7.21	100.00

Table 3: Number and Percentage of Persons by Position Title in Attendance at Conferences

Due to the low registration for the conferences only two conferences, instead of five, were conducted. One was held in Madison, Wisconsin, and the other was held in Washington, D.C. For those very few who had registered for conferences in other locations, arrangements were made with NITC to provide information.

As with the responses to the first mailing, math supervisors, elementary coordinators, and principals constituted the highest response to the invitations to the conferences. Of the total attending, persons from these positions comprised 58.80% of the participants.

Responses to the First Questionnaire

Participants at the one-day awareness conferences were asked to respond to a questionnaire regarding their future plans as a result of the conference, whether their interest in the product had increased or decreased as a result of the conference, and other general kinds of information such as mode of transportation, size of their community, and so on. Of the 34 in attendance at the two conferences, 29 (85.29%) of the participants responded to the questionnaire. A copy of the questionnaire is attached in Appendix B. Questions 1, 3, 6, 8, and 17 are not reported in the following discussion. Data from questions 1 and 6 have already been reported in Table 3. The results of question 3 were not interpretable. Not enough persons responded to question 8 for the data to be meaningful. Information from question 17 was used by the project staff to evaluate the conference presentations.

Since there had been some dissemination of information about PIA prior to the project, it was considered of interest to determine whether participants had heard of the product from sources other than the printed materials distributed in this project. Of the 29 persons responding to the questionnaire,

13 (44.82%) first became aware of PIA as a result of the project's publications; ten (34.48%) heard about PIA from other people, and the balance of the participants (six) heard about PIA first from such sources as articles, NITC sponsored advertisements, and NITC promotional literature.

Question 4 was used to determine the size of groups attending from one agency. Of those who responded to the questionnaire, ten (34.48%) attended the conferences alone. Nineteen (65.51%) were in a party of two or more; the largest group contained four persons.

Question 5 data were collected to determine the most common type of transportation to the conferences. The data indicated that 27 (93.10%) of the participants came to the conferences by automobile. The balance used other means of transportation.

Data were collected in question 7 to determine the size of the potential market represented at the conferences. Participants represented an estimated 301 schools and 118,830 children. While PIA can be obtained for any grade level, Grades 1-6, most of the participants (88.88%) who responded to question 7 indicated that they would use the complete program. Eleven persons did not respond to the question.

In an effort to determine whether persons represented schools in rural, small city, or large city locales, question 9 asked participants to indicate the size of the community in which their school was located. Nearly half of the participants (14, or 48.27%) came from communities ranging in size from 35,000-300,000 population; six (20.68%) came from rural areas; three came from communities either below 35,000 or above 300,000. Seven (24.13%) did not respond to the question.

In questions 10 through 15, participants were requested to indicate their plans with regard to implementing PIA. It was not expected that many partici-

pants would know at that time, but it was felt that the responses to the questions would give some information about their perceptions of and interest in the product. The data reported in Table 4 show, as expected, that a majority of participants did not know whether they would adopt the product but that they were not rejecting the possibility. The data also show that the further away in time the decision was to be made, the less likely people were to respond to the question. It must be remembered, though, that most of those in attendance were not in a position to make a decision but only to report to some higher authority with decision-making power. Only one respondent indicated any decision relative to purchase or rental plans.

	Yes	No	Don't Know	No Response	Total
1971-1972	1	7	17	4	29
1972-1973	1	2	15	11	29

Table 4: Number Indicating Adoption Plans

With regard to questions 11 through 14, an insufficient number (of an already small number of participants) responded to the questions for the results to have much meaning. It would appear that the persons attending the conferences would prefer to purchase PIA rather than rent it. If they did purchase the program, they would want it in a format suitable for use on portable equipment--that is, as audiovisual materials. Even though PIA was described as a complete mathematics program, conference participants would prefer to use it as a supplemental tool. Most persons who responded to question 14 indicated the instructional value, particularly for remedial or enrichment purposes, of PIA was the most important benefit. The next highest ranked benefit was teacher

Inservice. Since PIA was perceived primarily as having supplemental instructional value and secondarily as having some inservice value, it is easy to understand why participants would prefer to purchase the series in an audio-visual format which is much more flexible than fixed broadcast schedules. Again, slightly less than half of the participants responded to any one of questions 11-14; only one-third of the participants responded to most of the questions. The results, therefore, must be handled with caution.

Data were gathered in question 15 relative to the obstacles which participants perceived in implementing the product. In rank order, the three most frequently noted obstacles were the cost of the tapes, the cost of the associated printed materials, and the lack of equipment for broadcasting PIA. However, no one obstacle was indicated by more than one-fourth of the participants responding.

In question 16 participants were asked to indicate their reactions to the conference in terms of whether or not it increased their interest in the product. Nineteen persons (65.51%) indicated that their interest in the product had increased, six (20.68%) indicated a decreased interest, and two persons were not affected one way or the other. Two persons did not respond.

Responses to Second Questionnaire

In October of 1971, a second questionnaire (attached in Appendix B) was distributed to the 34 participants in the conferences, and 25 persons responded for a 73.52% return rate. The major purpose of the questionnaire was to determine if any of the participants had adopted the product, and if they had not, their plans for the future. Of the 25 responses, three indicated they had adopted the product in at least three schools. Information relative to the number of students involved was incomplete. One person indicated that PIA video tapes had been purchased, the second that the program was being rented,

and the third person did not indicate either rental or purchase.

With regard to their future plans one respondent indicated that the school would adopt PIA, five did not know, 16 said they would not, and three did not respond. Again, in the second questionnaire, participants were requested to indicate the obstacles to adoption of the product. No one of the obstacles seems to have been perceived as a serious one by many of the respondents. The most frequently indicated obstacle was perceived by only one-third of the respondents. In rank order, the four most frequently cited obstacles were content, cost of the tapes, cost of the associated printed materials, and lack of television equipment. The indication that content was perceived as an obstacle must be considered in the light of two factors. One factor is that only one-third of the respondents cited content as an obstacle. The second is that many of the conference participants were from school districts located in communities most likely to have teachers well prepared to teach modern mathematics at the elementary school level. Thus, considering that the content of PIA is, as some mathematics educators describe it, second generation mathematics, many schools with teachers knowledgeable about contemporary mathematics will find that the PIA content is somewhat dated. In addition, Sesame Street had been released in color and was made available by the Public Broadcasting Corporation free of charge. PIA, on the other hand, was produced in black and white and rental or purchase charges are relatively expensive. PIA could still be a valuable resource to those school districts which have teachers less qualified to teach modern mathematics.

Costs

The proposal for the national dissemination of information about PIA was submitted simultaneously with a similar proposal for another Center product,

the Multiunit School-Elementary. It was suggested at that time that information could be disseminated about both products utilizing the same staff that would be required if only one proposal were supported with only minor additional costs for documents regarding the second product and travel costs associated with the conferences. Accordingly, both proposals were funded, and the staff worked on both projects. Under this arrangement, the total cost including salaries and wages, travel, supplies, printing, and other associated items for the national dissemination of information about PIA was $18,801.40. Aside from salaries and wages including overhead ($12,286.55), the largest expenditures were travel for the one-day conferences ($1,241.83), supplies and materials ($1,878.02), printing ($1,072.59), and other services[1] ($1,139.48).

With regard to cost consideration, of primary interest was the cost of stimulating attendance at the awareness conferences. The costs to the project were $552.98 per person attending. Since there is no valid information relative to the number of adoptions and the teachers and students involved, it is difficult to assess the value of the conferences, at least in terms of increased utilization of the product. However, considered in terms of the number of schools and children represented by the participants, the costs are not unreasonable.

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[1] Other services includes charges for purchase of mailing lists and for handling the bulk mailing of the publications, an activity for which the Center is not equipped.

IV

CONCLUSIONS AND RECOMMENDATIONS

Overview

In an effort to increase the utilization of PIA, the Center designed an awareness effort involving direct mail activities followed by one-day awareness conferences. In the first step, 31,557 announcement brochures were distributed to elementary school principals, superintendents, math supervisors, elementary coordinators and other positions. The overall response to the first mailing was 471 requests for further information for a 1.49% return. Particular group categories, especially math supervisors and elementary coordinators, showed a higher return, 6.65% and 2.53%, respectively (See Table 1). However, not all of the returns were from the original recipients of the materials (See Table 2).

More detailed printed information and an invitation to a one-day awareness conference were sent to the 471 persons responding to the first mailing. Of these, 34 (7.21%) attended the conferences. In terms of both number and percentage, math supervisors and elementary coordinators were the largest groups in attendance at the conferences.

Two conferences were held in April and May, 1971. One conference was held in Madison, Wisconsin, and the other in Washington, D.C. Feedback from the conference participants indicated that the greatest number traveled by automobile and came in groups. Participants represented 301 schools and slightly more than 118,000 children.

Two questionnaires were distributed to conference participants. One questionnaire was distributed at the conferences and the other was mailed to participants in October, 1971.

Of major concern in the first questionnaire was the extent to which participants had become interested enough in the product to at least consider adoption. As one would expect, a majority of those in attendance did not know whether they would adopt PIA either in the fall of 1971 or the fall of 1972.

Participants were also asked to indicate their perceptions with regard to possible obstacles in implementing PIA. The cost of purchasing or renting the video tapes and of purchasing the related printed materials was perceived as the major obstacle to adoption.

The primary purpose of the second questionnaire was to determine if any adoptions had taken place in the fall of 1971. Three of the 25 persons responding to the questionnaire indicated that they had adopted PIA; only one person in the first questionnaire indicated an intention to adopt PIA in 1971-1972.

Some Conclusions

While it may be true that superintendents and boards of education have the final authority to make decisions involving changes of the kind required to implement PIA, superintendents depend on persons most likely to be involved in administering and managing the innovation to gather and evaluate information and make a recommendation. Mathematics supervisors, elementary coordinators, and principals, in that order, provided the best entry for introducing information into school systems. Superintendents referred information most often to math supervisors and then to elementary coordinators. Supervisors and coordinators are also more likely to respond directly and are not so likely to send the information to other persons. A further indication that the majority of participants at the conferences were gathering and evaluating information and were not final decision makers is evidenced by the large

percentage which indicated that they did not know whether they would adopt the product.

Information gathering and evaluating is apparently done in groups. Nearly 66% of the persons attending the conferences came in groups of two or more, suggesting that information is usually gathered by more than one person. Two major advantages are realized when others are involved in such an activity. First the perceptions of more than one person provide validation for any report to the final decision makers. Secondly, the involvement of more than one person lends social support to the person seeking to institute a change.

The kind of report and support provided by participants when they returned from the conferences to their school system can be surmised by the fact that 66% of the participants indicated that the conference had increased their interest in the product. Perhaps this increased interest accounts for there being more adoptions reported in the second questionnaire than were indicated in the first questionnaire.

Participants perceived two major obstacles to implementation of the product: cost and lack of equipment. Participants, however, indicated more than one obstacle to adoption, suggesting that a combination of obstacles is a more common problem than any single one.

The approach used in this project, two mailings and a conference, appears to provide an excellent means for assuring that a dissemination staff eventually deals with only the most interested persons. Each mailing provides a mechanism for identifying persons with the most interest in the product and limiting the conference participants to those who have made enough of a commitment to expend resources to gather more detailed information in a face-to-face setting. The project created awareness among large numbers of persons, and yet was an efficient use of dissemination personnel in communicating directly with school staffs.

While the responses to the first mailing were rather small (1.49%), there are some potential long-term benefits. Many persons were made aware of the product for the first time. Of those in attendance at the conference, over 40% heard about the product for the first time as a result of the mailings. This suggests that nearly 12,000 persons on the first mailing were made aware of PIA for the first time. These represent a large number of potential adopters in any subsequent efforts.

The fact that most (93%) of the conference participants traveled by automobile indicates the possibility that had there been more conferences covering smaller regions more recipients of the second mailing might have attended one-day conferences. Attendance at conferences was probably only one indicator of active interest in the product, and it can be assumed that there were more people with a high degree of interest (and thus likely adopters) who did not attend the conferences. For economic reasons, rather than lack of interest, school systems tended to limit staff travel to distances that could be covered within two or three hours driving time. It would appear that the distance people had to travel suppressed attendance at the conferences.

The conduct of this project in disseminating information about PIA was identical, in terms of the procedures used, to those employed in a similar effort relative to the Multiunit School-Elementary (MUS-E). Both projects sent announcement brochures to a range of positions in school districts in approximately the same quantity to a national sample. Each project, on the basis of a return questionnaire requesting further information about the respective products, sent a second, more informative publication and an invitation to attend a one-day awareness conference. Throughout the sequence of events the responses to the MUS-E were substantially higher than for PIA. As a result, the costs for stimulating attendance at the conferences was nearly

ten times as great for PIA as for the MUS-E, $553 and $58 per person attending, respectively.

Since the procedures for both projects were similar but the results in terms of attendance and costs were substantially different, the obvious implication is that the product is the important variable. The procedures are viable ones for stimulating interest in a product and for efficient use of information dissemination resources, particularly personnel, since only interested persons are likely to respond. The product, however, must be one which potential adopters perceive as an attractive alternative. When PIA is considered in light of more recent developments in instructional television, (e.g. Sesame Street), the limitations of television technology in the classroom, and changes in the description of the content of mathematics for the elementary school, PIA may not be perceived as an attractive alternative to a school's present mathematics program. In addition, given the participants' perception of the product's use as supplemental rather than as a complete program (in spite of statements that PIA was designed as a complete program, not a supplemental one) and the costs of implementing the product, the attractiveness of PIA may have been diminished. It is also possible that the technology and equipment associated with television instruction are not readily accepted by school personnel. Even though Center conducted evaluation studies have shown PIA to be an effective instructional program, its value may not be worth the effort required to implement the series for reasons noted above.

The MUS-E, on the other hand, may be perceived as an attractive alternative to the self-contained classroom organization. Its benefits, such as increased participation in decision-making, increased professionalization of staff, and and improved environment for children's learning, may be perceived by school personnel as outweighing the costs of implementation.

Recommendations

Future efforts with other products should consider seriously the possibility of conducting a larger number of conferences. As suggested earlier, if more conferences had been located to cover smaller regions, it is possible that more persons would have been interested and able to attend conferences. This would be particularly true if the original mailings were distributed to math supervisors, elementary coordinators and principals and not to superintendents and other categories, even if the total number mailed was no larger than was true for this project.

More conferences would, of course, raise the total costs of such an effort. If there is a staff available for dissemination efforts, additional costs would be limited primarily to travel expenses and perhaps additional postage and materials in the second mailing. Even though the absolute cost would be higher, the cost per person attending would very likely be less. The result would be a more efficient operation and also a more effective use of resources in that information dissemination is clearly pinpointed to appropriate target audiences.

With regard to the conduct of the conferences, the experience with both the PIA and MUS-E projects suggests that it is highly desirable to have three persons on the conference staff--two persons to assume primary responsibility for presenting information and the third to function as a conference manager responsible for arrangements and the logistics required to support a conference.

Strictly in terms of variety, it is well to have two persons present the information. One person may be an "expert" representing the agency disseminating the information and the other an experienced practitioner. Another advantage is that while one staff member is engaged with the total group, the

other staff member is free to provide individual attention to specific questions and problems. In order to provide this kind of interaction, the presence of the third staff member to manage conference details is extremely helpful. It is also a good idea if the third person is familiar enough with the product to be able to respond to individual needs.

Summary

Information dissemination utilizing direct mail and one-day conferences as carried out in this project appears to be a viable dissemination technique. It is systematic and provides appropriate follow-up to initial information dissemination. Communication of information about a product is focused on the most favorable point of entry into a school system and on appropriate target audiences. Information is not communicated to inappropriate persons as is often the case in general dissemination. The more general and usual dissemination efforts should not be discontinued, but they should not be heavily depended upon for creating large-scale awareness and stimulation of interest. Less heavy utilization of these general techniques will release resources for more systematic efforts.

It is suggested, however, that an effort as described in this report should not be undertaken prematurely. That is, it is not wise to distribute information about a product until the product is ready for implementation and the necessary inservice resources are available to respond to any demands. Furthermore, the nature of the product and its potential attractiveness as an alternative to present practices should be carefully assessed.

Appendix A

Printed Materials

Appendix B

Questionnaires

Questionnaire No. 1

WISCONSIN RESEARCH AND DEVELOPMENT CENTER FOR COGNITIVE LEARNING

PIA DISSEMINATION DATA

Please answer the following questions. Your cooperation will help us in our information efforts.

1. What is your position? _____ teacher _____ math coordinator _____ principal
   _____ superintendent _____ teacher educator _____ ETV representative
   _____ other

2. How did you first learn about PIA?
   _____ From one-page description brochure with attached reply card mailed by the Wisconsin R&D Center
   _____ From 24-page publication (black and white) mailed by the R&D Center
   _____ From National Instructional Television Center (NITC)
   _____ From Northwest Regional Educational Laboratory
   _____ From magazine advertisement
   _____ From other people
   _____ Other (specify) _____
   _____

3. When did you first hear of PIA? _____ since January 1971 _____ during 1970
   _____ before 1970

4. How many people are in your party at this conference? _____

5. How did you get to this conference? _____ plane _____ car _____ train _____ bus

6. Who are you representing? _____ a school _____ state education office
   _____ central administration of a school system _____ ETV station
   _____ other (specify) _____

7. If you decide to use PIA how many school buildings will be involved? _____
   How many children?_____ At which grade levels? (Specify) _____

8. Estimated median yearly income of the families in your school:
   _____ up to $4,999 _____ $5,000 - $9,999 _____ $10,000 and above

9. How would you best categorize your community? _____ rural
   _____ city under 35,000 _____ city from 35,000 to 299,999
   _____ city over 300,000

10. Do you plan to _____ purchase _____ rent PIA for use in 1971-72? _____ Yes
    _____ No _____ don't know For use in 1972-73? _____ Yes _____ No
    _____ don't know If you don't know, when do you plan to make a decision?_____

If answer to #10 is YES or DON'T KNOW please respond to the following:

11. If you did purchase would it be for _____ CCTV _____ ITFS _____ Open circuit TV or _____ AV? (check one)

12. If you did rent PIA would rental be for _____ CCTV _____ ITFS _____ Open circuit TV? (check one)

13. If you purchase or rent PIA would you use it as a complete mathematics program or as a supplement to your present program? _____

14. If you do use PIA, what benefits do you expect to derive from it? (number those applicable in order of importance) _____ teach new math to children
_____ inservice for teachers _____ remedial _____ enrichment
_____ continuity of presentation _____ other (specify) _____

If answer to #10 is NO or DON'T KNOW please respond to the following:

15. What problems do you see that might keep you from using PIA? _____ cost of tapes
_____ content _____ no inservice materials provided _____ cost of materials
_____ lack of equipment _____ other (specify) _____

EVERYONE PLEASE RESPOND TO THE FOLLOWING:

16. Did today's conference _____ increase _____ decrease _____ have no effect on your interest in using PIA?

17. Which of the below influenced you most in forming the opinion expressed in #16? (number from 1 to 6 in order of influence with number 1 indicating most influential)
_____ Discussion of history and development of PIA
_____ Demonstration with sample video tapes
_____ Summary of utilization
_____ Testimony on classroom use
_____ Question and answer sessions
_____ Prices and ordering

Questionnaire No. 2

PLEASE PRINT

Name_____ Position_____

School address_____
street city state zip

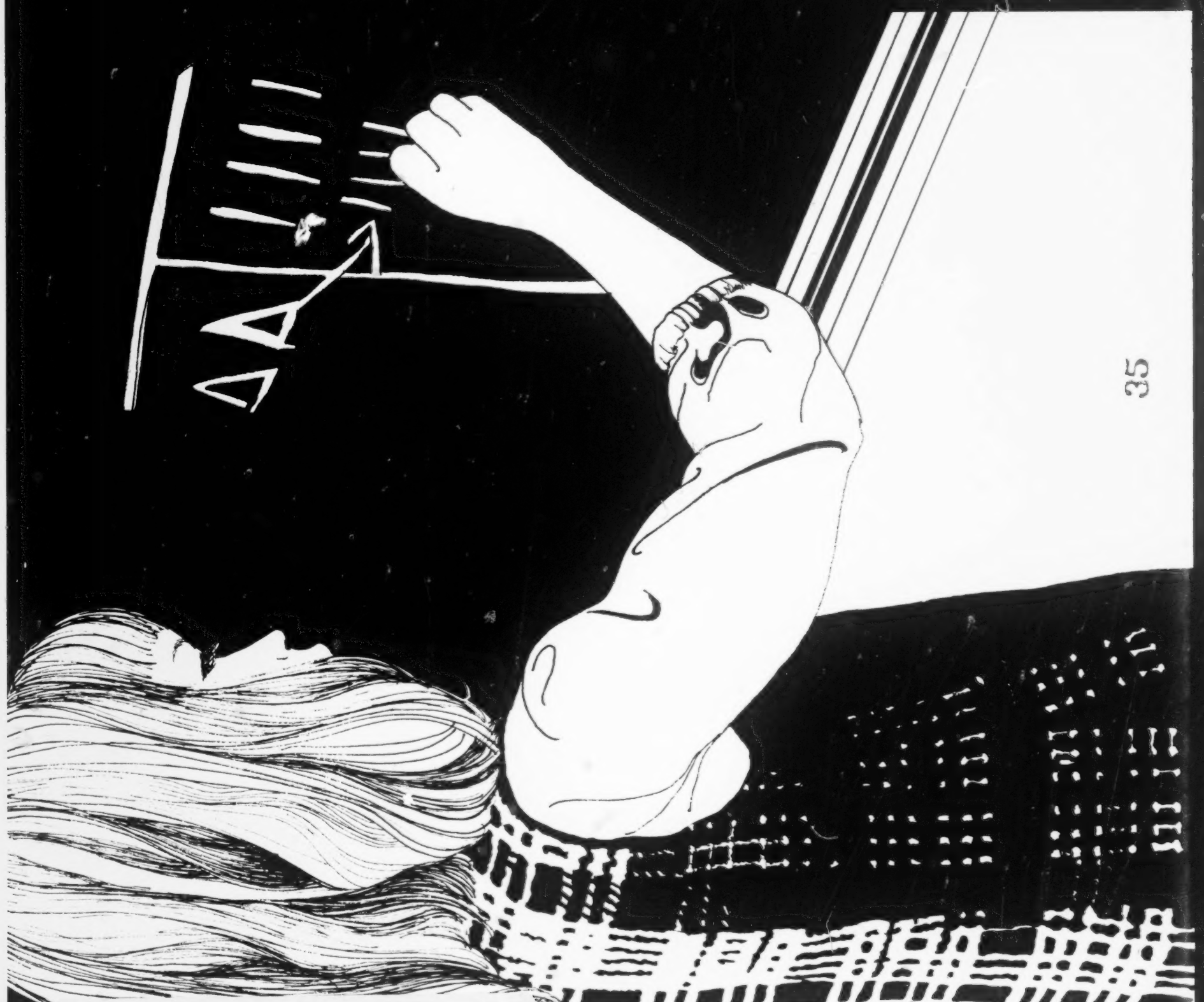
1. Are you using the Patterns in Arithmetic tapes in your school building? ___yes ___no
   in your system? ___yes ___no (in how many school buildings?_____)

2. If you are using PIA, how many children are involved? _____ in which grades?_____
   Have you ___purchased or ___rented PIA? (check appropriate one)

3. If you are not using PIA, do you plan to? ___yes ___no ___undecided

4. If you do not plan to use PIA, why not? ___cost of tapes ___cost of materials
   ___content ___lack of equipment ___other_____

Patterns in Arithmetic



ED 062208

Patterns in Arithmetic

- A complete mathematics program for grades 1—6
- 336 15-minute videotaped lessons with accompanying teacher's manuals and student workbooks

Wisconsin Research and Development Center for Cognitive Learning

The Wisconsin Research and Development Center for Cognitive Learning at the University of Wisconsin, Madison, is one of eight university-based Educational Research and Development Centers funded under the Cooperative Research Act (as amended by Title IV of the Elementary and Secondary Education Act of 1965). It was established in 1964 to generate new knowledge about children's learning and apply it to new approaches and materials for improving elementary education.

In the 1970–71 school year, nearly half a million children and 19,000 teachers and administrators in 35 states are using and/or evaluating products developed at the Center.

The major emphasis of the Center is development of a total system of Individually Guided Education (IGE) to allow for differences in individual children's rates and styles of learning. Materials to support individually guided reading, mathematics, motivation and environmental education are in various stages of development.

IGE includes a new plan of school organization, the Multiunit Elementary School, which opens up traditional patterns of teaching, learning, and decision-making to provide greater flexibility for individualized instruction and motivation. In 1970–71, it is being field tested by 70,000 children, 2,700 teachers and 250 administrators in 99 Wisconsin schools and 66 schools in eight other states.

Details on Center activities and products are available by writing the Information Office, Wisconsin Research and Development Center for Cognitive Learning, 1404 Regent Street, Madison, Wisconsin 53706.

Dear Colleague:

This report represents one of the most important stages in the educational research and development cycle: indicating to educators like yourself how a product or program might make a difference in your school or system.

Like all programs developed here at the Center, Patterns in Arithmetic has been continuously evaluated, refined and reevaluated in a variety of classroom settings. In the 1970–71 school year, 6,500 children and 230 teachers are participating in a year-long nationwide test to validate earlier evidence that all six levels of Patterns in Arithmetic are effective in a wide range of geographical, social and school contexts. The test is also expected to verify earlier evidence that PIA lives up to its potential for inservice by helping classroom teachers increase their understanding of modern mathematics.

Continuing research and development on PIA has brought new possibilities for flexibility. Televised lessons are now available for nonbroadcast use on slant track videotapes which can be played on small machines in the classroom. Since teachers need not rely on television broadcasting to use the series, they can control the pace of instruction and more effectively provide for individual differences among children. The Northwest Regional Educational Laboratory, Portland, Oregon, is currently evaluating the nonbroadcast format with encouraging results in eight small rural schools in Oregon, Alaska, Idaho, and Montana.

One disclaimer. While PIA has been cited with Sesame Street as an example of television's coming of age in the classroom, and while it relies heavily on visuals which children find appealing, it is not so elaborately produced as Sesame Street.

We call Patterns in Arithmetic to your attention for what it is: a carefully developed program in which format supports content to help children and teachers see how modern mathematics works.

Cordially,

Herbert J. Klausmeier

Herbert J. Klausmeier
Center Director

TV
television
broo

PIA: more than arithmetic

In the process of communicating his enthusiasm for PIA, a fourth-grader once summed up its development very well. He explained what he liked about the program, then added, "I bet whoever made it up knew about more than arithmetic."

The primary "more than arithmetic" element built into PIA is research-based knowledge on how children learn arithmetic and how their learning can be facilitated. This knowledge helped shape PIA's joint emphasis on concepts and computational skills which runs throughout the 336 televised lessons and the teacher's manuals and student workbooks for all six grade levels.

One learning principle followed is that children arrive at mathematical abstractions by observing concrete things (such as sets of objects), or actions (for example, "add on" or "take away") which are implicit in mathematical concepts. R & D Center research has established that certain demonstrations, illustrations or examples are easier for children to relate to abstractions than others. Hence, PIA televised lessons emphasize those physical situations which have been found to work best to illustrate concepts.

The way in which concepts are sequenced in PIA reflects the developers' argument that the order in which concepts are presented in traditional mathematics instruction does not square with current mathematics learning theory. They think, for example, that the idea of one-to-one correspondence which opens the PIA series in grade 1 is more fundamental than counting. Rather than initially performing the mechanical operation of counting, children determine whether there are more, fewer, or just as many objects in Set A as in Set B by trying to set up a one-to-one correspondence between the objects in A and the objects in B. Later in the series, children learn how to determine the relative numerousness of two sets by counting.

Another example of PIA's break with traditional order is presenting work with ratios before the rational numbers are introduced. Here the developers felt that children can better grasp the idea of pairs of numbers by considering, say, buying 5 apples for 14 cents (5/14) than by cutting a pie into 14 pieces and considering 5 of the pieces.

PIA follows the generally agreed upon principle that a spiraled organization of subject matter is more conducive to learning arithmetic than a nonspiraled organization. PIA does not spend more than two consecutive weeks on any one idea or skill, nor does it insist on a polished performance as soon as an idea or skill is presented. For example, carrying in addition in the hundreds is introduced early in the third grade, but the teacher who insists on mastery at this time will be disappointed. PIA spirals this skill throughout the year, allowing for reinforcement but avoiding long periods of drill. The skills of addition, subtraction, and particularly division are spiraled throughout as many as three or four years.

The spiraling organization does not mean, though, that children can only keep up with PIA if they have it from grade 1 forward. While grades 4, 5, and 6 require the background built in the earlier grades, grades 2 and 3 can be introduced independently.

PIA's role as an inservice program is another of its "more than arithmetic" dimensions. With the introduction of the "new math" into elementary school curriculum, many teachers needed to update their own knowledge of modern mathematics and teaching methods and do it quickly. The University of Wisconsin professor of mathematics and education who originated the development of PIA, Henry Van Engen, says the series was designed to do just that. "We felt that the only way for teachers to learn to teach the new math was to teach it." PIA producers capitalized on television's capabilities for presenting concepts pictorially and verbally and for carrying out the program's emphasis on relating mathematics to daily life. Television could also project models of effective teaching by bringing expert mathematician-teachers into partnership with classroom teachers.

Television offered other possibilities, too. It could carry a complete modern mathematics program to scores of schools at the same time. In rural areas, it could insure good mathematics instruction regardless of location or high teacher turnover. In urban areas, it could provide continuous instruction regardless of how many times a child might move to different schools within a system.

Continuing research and development has removed the limitation of television broadcast range and schedules by adapting the televised lessons for use on small videotape machines in individual classrooms.

Knowledge about arithmetic and more has gone into PIA and the developers hope children and teachers will acquire knowledge about arithmetic and more. The program is, of course, built around behavioral objectives for each televised lesson. But the overall objective, as teacher and assistant producer Robert Parr puts it, "is to bring new ideas into the classroom—for teachers and children alike."

PIA: the arithmetic

Any modern mathematics program for the elementary school is based on certain key mathematical ideas that permeate the entire course of instruction. In PIA the following ideas are spirally arranged throughout the six grade levels.

Set

The concept of a set is fundamental to developing and communicating ideas in mathematics. Beginning in grade 1, pupils become familiar with the simple concepts that involve sets.

Number

Both the natural numbers (counting numbers) and the rational numbers are developed in a logical sequence.

Numeration Systems

Pupils are taught to count and write the numbers 0–9, then the concept of place value is introduced.

Operation

A considerable portion of elementary school arithmetic is concerned with developing accuracy and speed in the four fundamental operations: addition, subtraction, multiplication and division. However, computing in itself is not enough. PIA places considerable emphasis on the ideas upon which computing is based in an attempt to make computation more than rote calculation. For example, in forming the sum 3 + 2 the pupil considers a stationary set of 3 objects and another set of 2 objects which appear to be joining the given 3. Thus 3 + 2 is looked upon as a set of 3 being joined by a set of 2 to form a set of 5. Addition of larger numbers is approached through tally charts to impart understanding of regrouping. Rectangular arrays are used to analyze the operation of multiplication.

2
Pupils
Mark

Mathematical Sentence (Equations and Inequalities)

It is important that pupils begin to develop the ability to generate clear and precise mathematical sentences (equations) as soon as possible in order to solve problems. In the first grade the pupil encounters many experiences with pictures and objects which lead to basic sentence forms. In word problems, pupils are requested to "write a sentence which tells the story of the problem" before finding the solution. The following is an example selected from the third grade: "A box holds 6 apples. How many boxes are needed for 30 apples?" The sentence associated with this problem is $n \times 6 = 30$.

Measurement

Due to its importance in everyday life as a key link between our mathematical and social environment, measurement is systematically studied, beginning in the first grade. As an introduction the first grade pupil becomes familiar with the concept of relative length (the desk is less than five pencil-lengths) and nonstandard units of measure (a pencil). Upon completing the first four grades, the pupil will be able to carry out approximate linear measurements in standard units (inches, feet, yard, quart, pint), to find the perimeter of some simple geometrical forms (triangle, rectangle), and to make conversions from one unit to another.

Geometry

One of the unique features of the program is a systematic development of elementary geometrical concepts beginning in the first grade. Aside from learning the names of the more common geometrical figures, the pupil becomes familiar with open and closed curves, interiors and exteriors of geometrical forms, points, lines and angles, intersection of curves, parallelism, perpendicularity, simple geometric transformations, symmetry, etc.

Number Theory

Properties of special sets of numbers are developed including primes, composites, factors, and odd and even numbers.

Practical Aspects

The practical aspects of arithmetic are important enough in the daily activities of pupils to warrant special attention. Beginning in grade 1 the pupil is taught linear measure and capacity; by the end of grade 4 he will have some experience with measuring the boundary and area of plane geometrical forms. Other topics covered are money and making change and use of the thermometer.

Television and Classroom Teachers

The three television teachers in PIA introduce concepts and skills using an informal approach and a variety of visuals. The classroom teacher coordinates the follow-up materials and organizes instruction around individual children's needs. Since the television teacher is typically seen for only 15 and never more than 30 minutes a week, the majority of teaching is live and requires preparation. The PIA project staff recommends that teachers spend at least 15 minutes reviewing the manual before each televised lesson to become familiar with concepts to be presented. The teacher's familiarity with the manuals and exercise books is central to coordinating them with the tapes.

The principal is instrumental in developing a program that will take advantage of PIA's inservice potential and help teachers work with the series. He must also supervise scheduling and availability of equipment.

Developing and producing the 336 videotapes and the teacher's manuals and pupil exercise books for PIA was a team effort involving a context group, a video group and a group of classroom teachers.

The content group included Dr. Henry Van Engen, the television teachers, and the R & D Center staff members in charge of writing teacher notes and pupil exercises and evaluating the program. The video group included the television teachers, a member of the content group, a producer-director, a graphic artist, and an educational television consultant from the University of Wisconsin Television Center. Teachers and supervisors from schools piloting initial versions of PIA materials at each grade level served on an advisory board.

To develop a single 15-minute lesson the content group outlined objectives, content, and sequence and discussed teaching approaches. Then the television teacher wrote a rough script. A final content script and suggestions for supporting teacher's notes and pupil exercises were based on discussion of the rough.

The video group determined the format and television techniques best suited to the presentation of the concepts under discussion. A final script, including provision for visuals, went from the video group back to the content staff for further suggestions and refinement.

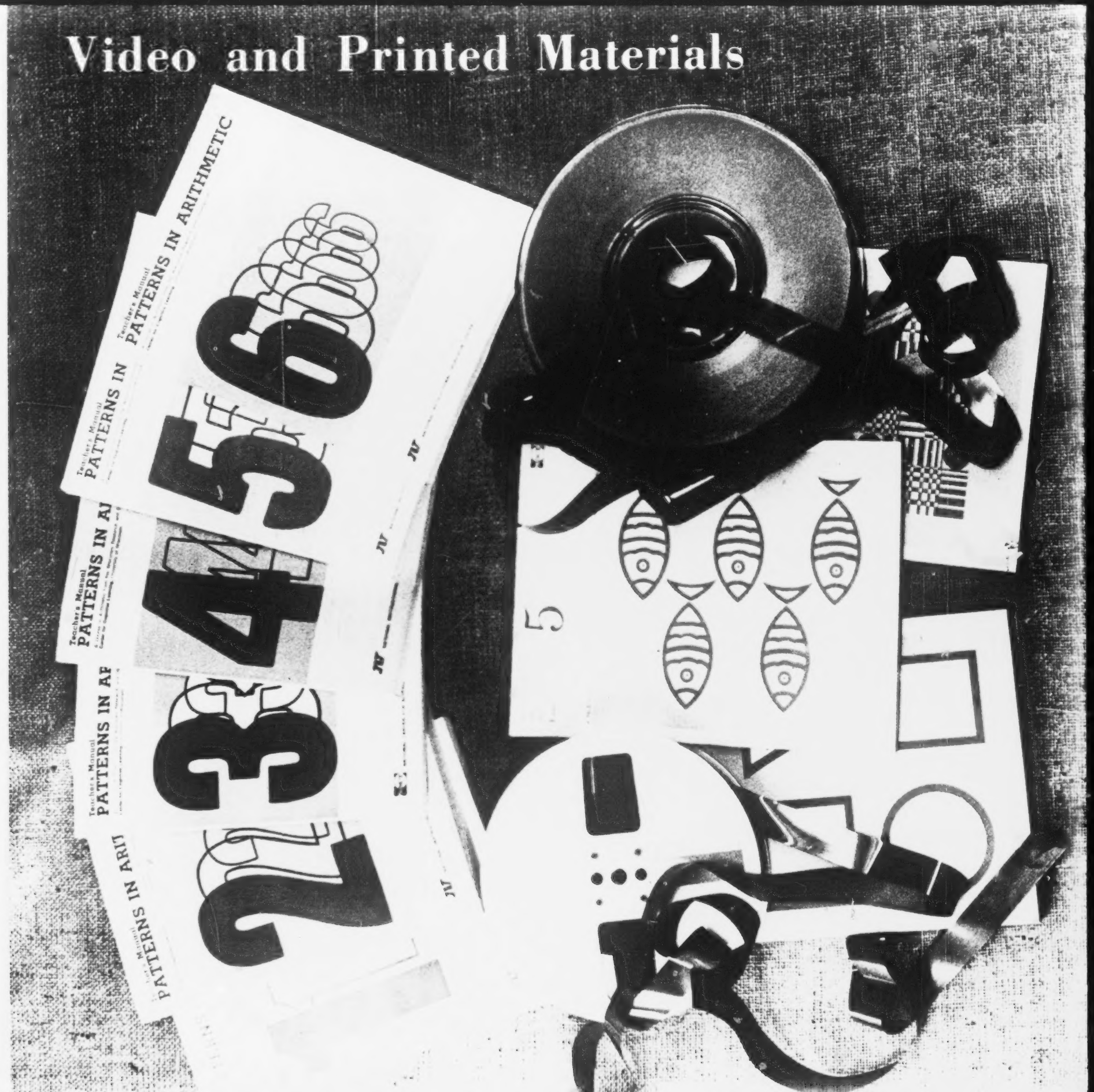
During a timed rehearsal, the panel studied the performance of the television teacher and the overall effect of the lesson. If modifications in content or visuals seemed desirable, they were made before the lesson was taped and were reviewed by the panel.

Once the lessons were viewed by teachers from the pilot schools, feedback was obtained by regular class visitations, tests and questionnaires, and periodic meetings of the classroom advisory board. In the early development stage, modifications were made in each of the components of PIA. Review and revision of printed materials has been a continuous effort up through the past year. The manuals for first and second grade, for example, were recently revised around teachers' requests for statements of behavioral objectives and for more pre- and post-telecast activities.

Each section of the manual is organized around a telecast program. The first page of each presentation lists behavioral objectives for students and outlines the content of the telecast in sections headed The Student Can and The TV Teacher Will.

Next comes a Mathematical Background section which relates the telecast material to various principles and patterns of mathematics. Often indicated, too, is how a particular concept or skill has been handled in preceding lessons and how it will be handled in the future.

Video and Printed Materials



An Overview statement capsules the content of the telecast. It is followed by suggestions for Pre-Telecast Activities, Materials needed for the telecast (if any), a Telecast Description, and suggestions for Post-Telecast and Follow-up Activities. Some programs have as many as a dozen suggestions for follow-up activities. In addition, various exercises for different kinds of learners are identified. Some activities are recommended for all children, others for slow learners, others for fast learners.

Pupil exercise books are keyed to the telecasts and the teacher's manual. Feedback from students as well as teachers has been incorporated into revision of the books. The books generally contain three types of activities for each program: exercises of varying difficulty related to concepts introduced in the telecast; review materials to maintain skills and review problem-solving techniques; and exercises which extend concepts introduced earlier and provide a new challenge for each student.

Evaluation

Evaluation of PIA began in 1966–67 when grades 1 and 3 were field tested with 9,000 children in Wisconsin and Alabama. Since that time, additional studies to test other aspects and levels of PIA have involved 10,000 children in Virginia, New York, Illinois, Oregon, Alaska, Idaho, Montana, Minnesota and Wisconsin.

The 1966–67 field test of grades 1 and 3 used teacher and pupil inventories and two standardized achievement tests, one of which was designed by Educational Testing Service specifically to test concept attainment from PIA. The PIA staff, in addition to determining overall effectiveness and achievement differences between states, was interested in seeing how operational the program was in various socioeconomic groups and sizes of communities.

Study groups in both grades compared favorably with norm groups on standardized concepts tests and standardized computation tests. Nearly 70 percent of the first graders using PIA scored above the 50th percentile. On one computation test given to the third graders in the field test, 54 percent of the children were achieving above the 50th percentile after one year in the telecourse, whereas before using PIA, only 18 percent of them had been achieving above that level.

Analysis of the data indicated no significant differences across four community sizes but significant differences were found across states in favor of Wisconsin at both grade levels. The results in both grades also tended to favor the high and middle socioeconomic groups over the low.

At both levels, the opinion inventories showed that teachers and children liked the PIA program, and teachers indicated that the concepts covered were both appropriate and well paced. Teachers felt grade 1 was aimed at middle ability children and grade 3 at middle to high ability. Responses from teachers indicated that PIA was an effective inservice program.

In the 1967–68 school year, thirty classes in Minnesota, Wisconsin, and Alabama were tested with PIA grade 2. Post-test results compiled from standardized tests clearly indicated that PIA classes exceeded performance of the norm population at the end of grade 2. In view of the fact that the group was slightly below norm at the beginning of grade 2, this data in particular supported PIA. Again, pupil and teacher opinion inventories produced comparable results for grades 1 and 3.

A test of grade 5 in the same year with 1,600 Wisconsin students indicated that PIA participants learned traditional computation skills and important concepts commensurate with their expected achievement. More than that, material covered in PIA which is not typically included in standard curriculum, particularly in geometry, was received well and test results were satisfactory. Computation problems tended to be easier at the end of the year than at the testing period immediately following the period of topic coverage. This suggests that skills learned early in the year are not forgotten but reinforced by the structure of the pupil exercises. In the 1968–69 school year grade 6 was tested in 62 classes in Wisconsin with similar results.

In the 1970–71 school year, 6,500 children in schools randomly selected from a wide range of geographic areas and social backgrounds are involved in a field test of all six levels. Children from the inner cities of Chicago and Portland, Oregon, and from Harlem and Spanish Harlem are participating, as well as children from rural areas in Vermont and from the fringe of Appalachia in Virginia. Another 6,500 students in the same locales are using their regular textbook series rather than PIA. The achievement of both groups will be measured and compared by extensive post-testing to test the Center's thesis that PIA is effective in a variety of social and geographical settings.

At the same time, the Northwest Regional Educational Laboratory in Portland, Oregon, is evaluating the effectiveness of the nonbroadcast version of PIA for individualizing instruction in small rural schools in Alaska, Oregon, Montana, and Idaho. This evaluation will continue through 1972 and will provide school administrators with dependable information on the most effective way to use PIA materials for an individualized instructional program.

Utilization

- ● Cities under 35,000
- ★ Cities 35,000–300,000
- ☆ Cities over 300,000
- * Northwest Regional Educational Laboratory Small School Program
- ** State - wide use

Patterns in Arithmetic Usage 1970–71

(Estimated 389,000 children and 13,000 teachers)

Before the 1967–68 school year, the impact of PIA was restricted to those schools in Alabama, Minnesota, and Wisconsin which had participated in the developmental and field testing years of grades 1–4. By 1967–68, the National Instructional Television Center estimated that a minimum of 85,000 students in Alabama, Minnesota, South Carolina, and Wisconsin were enrolled. By 1968–69, 150,000 students were enrolled in PIA telecourses for grades 1–5. Fifteen transmission centers in 13 states were providing telecourses for populations ranging in size from the 28,000 pupils served by the South Carolina Educational Television Commission to the 85 pupils involved in the Northwest Regional Educational Laboratory's rural education research project.

In the 1969–70 school year, an estimated 395,000 children in 19 states were using the series, and in the current year, more than 389,000 children and 13,000 teachers in 22 states are seeing the program.

Patterns in Arithmetic
Available from NITC in Three Ways

	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5	Grade 6
Rental for CCTV						
School Population						
800,001–1,600,000	$2400	$3600	$4800	$4800	$4800	$4800
400,001– 800,000	2128	3192	4256	4256	4256	4256
200,001– 400,000	1856	2784	3712	3712	3712	3712
100,001– 200,000	1584	2376	3168	3168	3168	3168
50,001– 100,000	1312	1968	2624	2624	2624	2624
up– 50,000	1040	1560	2080	2080	2080	2080
Teacher's Manuals						
500– up	$ 1.62	$ 2.48	$ 1.50	$ 1.66	$ 1.80	$ 2.52
10– 499	1.80	2.75	1.65	1.85	2.00	2.80
1– 9	2.50	4.00	2.50	2.50	3.00	3.50
Student Exercise Workbook						
500– up	$ .63	$ .72	$ .72	$ .81	$ .81	$ .81
10– 499	.70	.80	.80	.90	.90	.90
1– 9	1.00	1.25	1.25	1.50	1.50	1.50
Purchase for A/V [1,2]						
Ampex 1"	$1200	$1800	$2400	$2400	$2400	$2400
Sony ½", EIAJ ½"	625	925	1225	1225	1225	1225
Purchase for CCTV [1]						
School Population						
200,001– up						
Quad 15	$4160	$6240	$8320	$8320	$8320	$8320
Quad 7½	3840	5760	7680	7680	7680	7680
Helical Scan	3200	4800	6400	6400	6400	6400
50,001– 200,000						
Quad 15	$3680	$5520	$7360	$7360	$7360	$7360
Quad 7½	3360	5040	6720	6720	6720	6720
Helical Scan	2720	4080	5440	5440	5440	5440
1– 50,000						
Quad 15	$3360	$5040	$6720	$6720	$6720	$6720
Quad 7½	3040	4560	6080	6080	6080	6080
Helical Scan	2400	3600	4800	4800	4800	4800

[1] Includes tape stock; price is less if school supplies tapes.

[2] Includes 1 teacher's manual, 25 student workbooks, each level.

Availability

PIA is available from the National Instructional Television Center on the basis of rental, purchase for television, or purchase for audiovisual.

Rental: PIA courses are available to institutions for use over CCTV and ITFS systems and to open-circuit television stations.

Purchase for Television: PIA may be purchased by institutions for use over CCTV and ITFS systems and open-circuit television stations serving multiple receiving stations. Published prices are for single transmission systems. Charges for multiple transmission systems are available on request.

Purchase for Audiovisual: Institutions may purchase PIA courses for audiovisual use over small systems that serve a single receiving station.

When purchased for television or audiovisual:

1. The purchasing institution is given unlimited use rights in perpetuity.
2. Use is exclusive to that institution. Tapes may not be loaned, rented, or copied.
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Outline of Televised Lessons

Grade 1

1 One-to-One Correspondence
2 Transitivity of "As Many As"
3 The Numbers from One to Four
4 Ordering the Numbers from One to Four
5 Conservation of Numerousness I
6 Transitivity of "More Than" and "Fewer Than"
7 Conservation of Numerousness II
8 Introduction to Addition
9 The Numbers from Five to Seven
10 The Numbers from Eight to Ten
11 Ordering the Numbers from One to Ten
12 Addition Combinations I
13 Addition Combinations II
14 Geometry: Open and Closed Curved
15 Addition Combinations III
16 Geometry: Points and Curves
17 Addition Combinations IV
18 Geometry: Betweenness
19 Sets of Ten
20 Numeration: Eleven Through Nineteen
21 Numeration: Twenty Through Ninety-Nine
22 Numeration: Order of Ten Through Ninety-Nine
23 Our Monetary System
24 Introduction to Subtraction
25 Subtraction Combinations I
26 Introduction to Measurement
27 Subtraction Combinations II
28 Standard Units of Measurement: Inch, Foot
29 Geometry: Names for Common Curves
30 Ordinal Numbers
Midyear Check-up Exercises
End-of-Year Check-up Exercises

Grade 2

1 Counting and the Numeration System I
2 Counting and the Numeration System II
3 Order of the Numbers from 1–99
4 Ordinal Numbers
5 Introduction to Addition
6 Addition Combinations I
7 Addition Combinations II and Number Sentences
8 Geometry: Line Segments and Points
9 Geometry: Polygons
10 Addition Combinations III and Number Sentences
11 The Associative Principle
12 Another Look at Combinations: Adding Zero and Ten
13 Introduction to Tally Charts
14 Two-Digit Addition I
15 Two-Digit Addition II
16 Our Monetary System I: Coins
17 Introduction to Subtraction
18 Subtraction Combinations I
19 Subtraction Combinations II
20 Subtraction Combinations III
21 Addition Combinations IV
22 Geometry: Squares and Rectangles
23 Geometry: Solid Figures
24 Counting and the Numeration System III
25 Two-Digit Addition: Partial Sums
26 Counting and the Numeration System IV
27 Ordering the Numbers from 100–999
28 Our Monetary System II: Currency
29 Two-Digit Subtraction I
30 Two-Digit Subtraction II
31 Two-Digit Subtraction III
32 Sentences of the Form $6 + n = 9$

33 A Variety of Problems
34 Addition Tables
35 Introduction to Linear Measure
36 Standard Units of Linear Measure
37 Addition and Subtraction on the Number Line
38 Two-Digit Addition: Shortest Form
39 Slide and Turn Geometry
40 Sentences and Solution Sets
41 Order and Tally Charts: 0–99
42 Order and Tally Charts: 100–999
43 Three-Digit Addition
44 Three-Digit Subtraction
45 Introduction to Multiplication
46 Multiplication: Combinations and Commutativity
47 Multiplication: Problem Solving
48 Geometry: Regions
Midyear Check-up Exercises
End-of-Year Check-up Exercises

Grade 3

1 Geometry: Line Segments and Closed Curves
2 Geometry: Angles and Triangles
3 Geometry: Curves with Inside and Outside
4 Geometry: Polygons
5 Names for Numbers: Ones and Tens
6 Names for Numbers: Ones and Tens
7 Names for Numbers: Tens and Hundreds
8 Addition: Commutative Law
9 Addition: Associative Law
10 Addition: Sums of Two Numbers Greater Than 10
11 Addition: Sums of Three Numbers Greater Than 10
12 Names for Numbers: Base Five
13 Number Order: Ones, Tens, and Hundreds
14 Subtraction: Basic Facts
15 Subtraction: Numbers Less Than 1000
16 Problem Solving: Problems Using $13 + n = 92$, $n + 17 = 65$
17 Introduction to Multiplication
18 Multiplication: Commutative Law
19 Multiplication: Products Less Than 19
20 Multiplication: Products Less Than 19
21 Multiplication: Tree Diagrams
22 Problem Solving: Addition and Subtraction
23 Problem Solving: Comparative Subtraction
24 Multiplication: Factors of 18
25 Multiplication: Factors of 12 and 16, One Facts
26 Problem Solving: Division Using $n \times 3 = 12$
27 Problem Solving: Division Using $n \times 14 = 56$
28 Problem Solving: Shortcuts for Solving $n \times 3 = 36$
29 Multiplication: Distributive Law
30 Multiplication: 4×5 Viewed as $4 \times (2 + 3)$
31 Names for Numbers: Base Eight
32 Multiplication: 3×8 Viewed as $3 \times (5 + 3)$
33 Zero in Addition, Subtraction, Multiplication
34 Names for Numbers: Thousands
35 Number Order: Thousands
36 Addition and Subtraction: Thousands
37 Geometry: Similar and Congruent Polygons
38 Geometry: Congruent Angles and Segments
39 Geometry: The Circle
40 Introduction to Rate Problems
41 Problem Solving: Rates
42 Number Patterns
43 Multiplication by 10, 100, and 1000
44 Multiplication: Associative Law
45 Multiplication: Products Like 3×20, 2×400
46 Multiplication: Products Like 3×24
47 Multiplication: Computing 3×24 in Vertical Form
48 Line Measure: Inches and Feet
49 Line Measure: Feet and Yards
50 Multiplication: Products Like 3×247
51 Problem Solving: All Types
52 Liquid Measure: Cups, Pints, Quarts, Gallons
53 Even and Odd Numbers
54 Introduction to Fractions
55 Many Ways to Divide a Whole
56 Shortcuts in Computation
57 Estimating Sums, Differences, Products
58 Problem Solving: Multiplication
59 Problem Solving: Relating $n \times 3 = 12$ to $3 \times n = 12$
60 Problem Solving: Relating $n \times 3 = 12$ to $12 \div 3 = n$
61 Money: Computation with Dollars and Cents
62 Money: Making Change
63 Review: Geometry and Measurement
64 Review: Number Properties
Midyear Check-up Exercises
End-of-Year Exercises

Grade 4

1 Geometry: Parallelogram, Rectangle, Square, and Triangle
2 Geometry: Intersecting, Parallel, and Perpendicular Lines
3 Geometry: Polygons
4 Geometry: Three-Dimensional Figures
5 Geometry: Visualizing Three-Dimensional Figures
6 Multiplication: Distributive Property
7 Multiplication: Distributive Property and Verbal Problems
8 Multiplication: Two-Digit Number by a One-Digit Number
9 Problem Solving: Review
10 Geometry: Vertices, Edges, and Faces of a Polyhedron
11 Addition: Sentences Like $3 + n = 8$ and $n + 5 = 9$
12 Problem Solving: Problems Represented by Sentences Like $n + 8 = 17$ and $6 + n = 13$

13 Division: Sentences Like n x 4 = 24
14 Division: Shortcut for Sentences Like n x 3 = 57
15 Division: Relating Sentences Like n x 3 = 57 and 57 ÷ 3 = n
16 Problem Solving: Relating Sentences Like 3 x m = 24 and m x 3 = 24
17 Numeration and Place Value: Millions
18 Numeration Systems: Indian and Egyptian
18a Review: Multiplication and Division Sentences
19 Ratio: Introduction
20 Ratio: Finding Ratios in the Same Set
21 Problem Solving: Ratios I
22 Problem Solving: Ratios II
23 Numeration: Billions
24 Addition and Subtraction: Estimation
25 Division: Remainders
26 Number: Factors
27 Multiplication: Tables
28 Multiplication: Patterns in Tables
29 Multiplication: Distributive Property Using Products Like 2 x 239
30 Multiplication: Products Like 3 x 348 in Vertical Form
31 Multiplication: Shortcut for Products Like 3 x 248
32 Polygonal Numbers
33 Geometry: Similar and Congruent Triangles
34 Geometry: Perimeter
35 Multiplication: Products Like 56 x 30
36 Geometry: Circle and Ellipse
37 Geometry: Paper Folding
38 Multiplication: Products Like 38 x 26
39 Multiplication: Vertical Form for Products Like 32 x 48
40 Multiplication: Estimating Products
41 Problem Solving: Multiplication and Division
42 Number Patterns: Pascal's Triangle
43 Fractions: Introduction
44 Fractions: Ordering
45 Numbers: Factors and Divisors
46 Fractions: Fractions in the Same Set
47 Fractions: Basic Fraction
48 Fractions: Number Line
49 Problem Solving: Sentences Like n − 37 = 54
50 Problem Solving: Sentences Like 54 − n = 37
51 Measurement: Reading Scales
52 Measurement: Conversion Problems
53 Geometry: Slides, Turns, and Flips
54 Problem Solving: Multiple-Step Problems
55 Problem Solving: Average
56 Division: One-Digit Divisors
57 Division: Two-Digit Divisors
58 Division: Three-Digit Divisors
59 Numbers: Prime and Composite
60 Sentences: Equalities and Inequalities
61 Sentences: Equivalent Sentences
62 Problem Solving: "Times as Many" Problems
63 Geometry: Reflections
Midyear Check-up Exercises
End-of-Year Check-up Exercises

Grade 5

1 Factors of a Number
2 Prime and Composite Numbers
3 Prime Factorization
4 Fractions: Review
5 Fractions Greater Than One
6 A Method for Obtaining Fractions in the Same Set
7 Fractions and Counting Numbers
8 A Test for Fractions in the Same Set
9 Sets of Fractions Associated with Points on the Number Line
10 Problem Solving: addition, subtraction and multiplication
11 Number pairs I
12 Number pairs II
13 Problem Solving: addition, subtraction and equivalent sentences
14 Multiplication: Products Like 243 x 27
15 Multiplication: Products Like 267 x 183
16 Odd and Even Numbers
17 Problem Solving: Multiplication and Division, Equivalent Sentences
18 Division: Improving Estimates I
19 Division: Improving Estimates II
20 Geometry: Symmetry and Reflections I
21 Geometry: Properties of Reflections I
22 Geometry: Properties of Reflections II
23 Geometry: Symmetry and Reflections II
24 Fractions: Equal Fractions
25 Fractions: Introduction to Addition
26 Addition of Fractions: Sums Like 1/4 + 3/4 = 4/4 = 1
27 Introduction to Mixed Numbers
28 Introduction to Addition of Mixed Numbers
29 Fractions: Introduction to Subtraction
30 Introduction to Subtraction of Mixed Numbers
31 Decimal Notation: Tenths
32 Decimal Notation: Hundredths
33 Introduction to Negative Numbers
34 Ordering the Rational Numbers I
35 Ordering the Rational Numbers II
36 Area I
37 Area II
38 Area: Standard Units of Measure
39 Ratios: Conversion of Units of Measure

40 Ratios: Cross Product Test for Ratios in the Same Set
41 Problem Solving: Ratios
42 Problem Solving: Multiple-Step Problems
43 Division: Improving Estimates III
44 Division: Interpreting Remainders
45 Geometry: Symmetries of the Square
46 Many Names for Numbers
47 Problem Solving: Addition and Subtraction of Mixed Numbers
48 Geometry: Reflecting Lines
49 Geometry: Properties of Reflections III
50 Addition: Many Names for Numbers
51 Addition of Fractions with Different Denominators I
52 Addition of Fractions with Different Denominators II
53 Clock Arithmetic
54 Subtraction of Fractions with Different Denominators
55 Problem Solving: Subtraction of Mixed Numbers
56 Equivalent Sentences
57 Introduction to Per Cent
58 Problem Solving: Per Cent
59 Sentences: Inequalities and Graphs
60 Sentences: Graphs for Compound Sentences
61 Measurement: The Nearest Unit
62 Problem Solving: Addition and Subtraction of Decimals
63 Short Cuts for Computation
64 Mathematical Patterns and Puzzles
Midyear Check-up Exercises
End-of-Year Check-up Exercises

Grade 6

1 Measurement: Linear Measure
2 Ratio and Conversion Problems
3 Measurement: Area I
4 Problem Solving: Ratios
5 Measurement: Volume I
6 Division: Refining the Process I
7 Division: Interpreting Remainders
8 Geometry: Two- and Three-Dimensional Figures
9 Fractions: Meanings for Fractions
10 Fractions: Equal Fractions
11 Fractions: Ordering Fractions
12 Fractions: Addition and Subtraction I
13 Enrichment: Working with Sets
14 Fractions: Addition and Subtraction II
15 Numeration: Decimals
16 Decimals: Addition and Subtraction
Evaluation: Instructions for Check-up I
17 Division: Refining the Process II
18 Measurement: Angle Measurement I
19 Measurement: Angle Measurement II
20 Fractions: Multiplication I
21 Fractions: Multiplication II
22 Fractions: Multiplication III
23 Fractions: Properties of Multiplication
24 Geometry: Reflections I
25 Geometry: Reflections II
26 Fractions: Stretchers and Shrinkers
27 Fractions: Multiplication Shortcuts
28 Problem Solving: Multiple-Step Problems
29 Enrichment: Symmetries of a Triangle
30 Measurement: Area II
Evaluation: Instructions for Check-up 2
31 Relations and Functions I
32 Relations and Functions II
33 Interpreting Graphs
34 Measurement: Volume II
35 Fractions: Multiplication of Decimals I
36 Fractions: Multiplication of Decimals II
37 Solving and Graphing Inequalities
38 Positive and Negative Numbers I
39 Positive and Negative Numbers II
40 Two-Dimensional Coordinates
41 Equivalent Sentences
42 Fractions: Division I
43 Fractions: Division II
44 Fractions in Whole Number Division
Evaluation: Instructions for Check-up 3
45 Enrichment: Base Two Numeration
46 Decimals: Division I
47 Decimals: Division II
48 Decimals: Division III
49 Decimals: Division IV
50 Ratio: Review and Extension
51 Similarity I
52 Similarity II
53 Similarity III
54 Rational Numbers: Density
55 Finding Averages
56 Probability I
57 Probability II
58 Per Cent: Meaning
59 Per Cent: Problem Solving I
60 Per Cent: Problem Solving II
61 Per Cents and Decimals
62 Problem Solving: Review and Extension
63 Exponents
64 Patterns and Problems
Evaluation: Instructions for Check-up 4
Answers
Grids

Publication Credits

Writer — Alice Weck

Editor — Mary Horn

Art Director — Karen Nielsen

Photographers — Vera Meyer and Karen Nielsen

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Published by the Wisconsin Research and Development Center for Cognitive Learning, supported in part as a research and development center by funds from the United States Office of Education, Department of Health, Education, and Welfare. The opinions herein do not necessarily reflect the position or policy of the Office of Education. No official endorsement by the Office of Education should be inferred.
(Center No. C-03, Contract OE5-10-154)